



Zajel: Logistics Solutions using Mini-Autonomous Vehicles,

The First phase as A Graduation project

Introduced by

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I. Executive Summary

In light of Egypt's Vision 2030 and the United Nations Sustainable Development Goals, this project proposes to develop an autonomous vehicle delivery service in Egypt, named Zajel. Zajel is an Arabic word which describes a carrier pigeon. Zajel will use autonomous vehicles to deliver food, medicine, and other goods safely and efficiently, whether in B2B or B2C mode.

In the first stage, we seek to develop an autonomous vehicle using two main technologies and resources: embedded systems, (embedded Linux) and TurtleBot mobile robots available in DEBI's campus. The project tackles the main problems mentioned below:

1. The development of the distribution and delivery sector in Egypt, particularly private sector, e.g., logistics company, delivery platforms, factories, restaurants, etc. through:
 - a. Reducing the budget allocated for cars, motorcycles and the salaries of drivers and delivery men.
 - b. Improving the process of transferring various products between the source and the destination, e.g., between two individuals or two companies or between a company and an individual.
 - c. Tackling frequent road accidents due to delivery men by providing an autonomous vehicle that can transport goods safely and efficiently.

II. Project background

2.1 Problem

Egypt is encountering several challenges related to transportation. Road accidents are a major cause of death and injury in Egypt. In 2019, Central Agency for Public Mobilization and Statistics (CAPMAS) reported in its biannual report 5220 car accidents resulting in 1567 Deceased persons, 6046 injury, and 8335 damaged vehicles.

2.2 Motivation

Egypt is well-positioned to become a leader in this autonomous-vehicle logistics and delivery market. The country has a large and growing population of 105, 301, 124 (CAPMAS, 2023). It is home to several metropolitan cities with high demand for delivery services.

- **The project is geared by the following motives:**
 - a. The desire to automate the logistics and distribution sector in Egypt.
 - b. The need to address the problem of road accidents in Egypt.
 - c. The potential of autonomous vehicles to improve transportation efficiency and safety.
 - d. The desire to contribute to the sustainable development goals of Egypt, and the United Nations.

III. Solutions and approach

3.1 Solution

Using autonomous vehicles can address these challenges. Mini-autonomous vehicles can navigate traffic more efficiently, and they are less likely to cause accidents. Additionally, autonomous vehicles can be powered by electricity, which can help to reduce air pollution.

The autonomous vehicle delivery service will use a fleet of mini-autonomous vehicles that are specifically designed for this purpose. The vehicles will be equipped with GPS and other sensors that will allow them to navigate safely and efficiently through urban areas. The vehicles will also be equipped with a variety of features that will make them more user-friendly, such as the ability to track the location of your order and receive notifications when it is delivered.

IV. Project Roadmap

The project will use the following solutions and approach in three main phases:

4.1 Phase 1 - duration (5 months)

It involves developing software, and hardware and validating it in a controlled environment, particularly inside Gezira Youth Centre, Zamalek, Cairo.

4.1.1 Used Technologies (T1)

1. It will use the concept of embedded Linux and TurtleBot mobile robots to develop an autonomous vehicle.
2. It will use a variety of sensors to detect its surroundings, including cameras, radar, and lidar.

4.2 Phase 2 - (duration 1 year)

The autonomous vehicle delivery service will be available in major cities across Egypt, including Cairo, Alexandria, and Giza. The service will be operated by a team of experienced marketeers, engineers, and technicians who will be based at a central location in each city.

4.2.1 Used Technologies (T2)

1. It is going to use artificial intelligence to process the data from these sensors and make decisions about how to navigate safely.
2. It is going to develop a cloud-based platform to manage the autonomous vehicle fleet.
3. It is going to supply an integrated ecosystem for requesting, tracking, and paying for services.

4.3 Phase 3 - (3 years)

The Egyptian government is supportive of drone technology, and it has enacted a law No. 216 of 2017, that makes it easier for aerial robots' companies to work in the country. Then, its executive regulation was issued by Prime Minister Decision No. 931 of 2018 to regulate the use, trading of automated or wirelessly powered aircraft.

Thus, recent technology depends on aerial robots will be embedded in the company roadmap looking for improving services, and expansion.

4.3.1 Used Technologies (T3)

Introducing and developing modern technology using drones to develop the services provided by the company. Its speed, accuracy and environmentally friendly. Drones can be used to deliver goods to customers quickly and efficiently. This could be a game-changer for

businesses that sell online or need to make deliveries in remote areas. This will definitely break new grounds that contribute to the expansion of Zajel in all governorates of Egypt.

V. Financials

5.1 Value proposition

The project of autonomous vehicle delivery service has the potential to revolutionize the way that goods are delivered in Egypt:

1. It contributes to reducing the budget allocated to drivers in companies and the distribution sector.
2. It makes it easier to transfer things between any two points including, but not limited to two individuals, two companies, or a company and individual.
3. It provides an integrated ecosystem, starting from the request, following it up, and ending with its delivery.
4. It replaces the problem of some delivery men who cause accidents on the roads.
5. It is an environmentally friendly product.
6. The project contributes to tackling two goals of Egypt's vision 2030, namely the 4th goal: knowledge, innovation and scientific research, and the 5th goal: environmental sustainability. (Presidency of the Egyptian Republic, n.d.)
7. It overlaps with the United Nations' sustainable development goals, namely the 9th Goal: industry, innovation, and infrastructure, and the 30th goal: climate action.

5.2 Customer segments

- Customers are mainly divided as follows:
 1. delivery platforms such as Marsol, Talabat; restaurants, different shops.
 2. Logistics companies such as FedEx, Aramex, and DHL.
 3. Factories, distribution companies.
 4. Individuals that would like to delivery service between two points.
 5. In the third phase of the project, we will aim at the health sector in diverse ways, whether first aid for the injured on the roads or places difficult to reach by ambulance, e.g., places of fires.

5.3 Partners

5.3.1 SEITech Solutions Company

As a leading provider of technologies in Embedded systems in Egypt, we seek its sponsorship for our project in its first phase of development that was previously mentioned. Through this fruitful collaboration, SEITech can provide us with its precious and technical experience, mentorship, and guidance.

5.3.2 Digital Egypt Builder Initiative (DEBI)

Digital Egypt Builders Initiative is launched by the Ministry of Communications and Information Technology (MCIT), which has granted us the scholarship to study, at University of Ottawa, a Master of Engineering in Electrical and computer engineering, major: Robotics and IOT (Internet of Things). DEBI is going to supply us with the required TurtleBot robots and mentorship in the proposed project.

5.3.3 University of Ottawa, Canada

According to Times higher education world Universities Rankings - 2023, University of Ottawa is ranked among Canada's top seven universities (Times higher Education, 2022). Being postgraduate students in it, the university will provide us with full support and supervision during the first phase, whether through practical guidance and direct supervision to bring the first phase of the project to the finishing line.

5.3.4 United Nations

This project overlaps with the United Nations' sustainable development goals, namely the 9th Goal: industry, innovation, and infrastructure, and the 30th goal: climate action. In 2022, the UN allocated funding of \$2.7 million and \$19 million for these two goals, respectively. Thus, this will help receive funding from the UN. (United Nations, n.d.)

5.4 Cost

- Phase one will be funded by co-founders' efforts and SEITech mentorship.
- In Phase two, the project is expected to require an initial investment to purchase autonomous vehicles, develop the necessary software and hardware, and hire a team of engineers and technicians. In addition, the marketing and sales strategy to reach potential customers and generate demand for your service.

5.5 Revenue Streams

It includes, but not limited, the resources mentioned below:

1. The autonomous vehicles rental contracts of customers that seek that kind of agreement.
2. Revenues from selling the self-driving vehicle itself to the target customers.

3. Commissions on daily deliveries.
4. License fees to reuse the developed technology by other individuals, and corporations.

VI. Conclusion

In brief, the autonomous vehicle delivery service project has the potential to revolutionize the way products are conveyed in Egypt. The venture is aligned with Egypt's Vision 2030 and the United Nations Sustainable Development Goals. In addition, it has a strong value proposition and a clear target market. Moreover, the project has identified several partners who can provide support and expertise. Finally, Zajel addresses the challenges confronting the transportation industry in Egypt.

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Appendix

License



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